AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A photodetector comprising a photoconversion structure, the photoconversion structure comprising:

an indium gallium arsenide (InGaAs) absorption layer, the InGaAs absorption layer having a Group III sublattice indium concentration greater than 53 percent; ~~and~~

~~an undoped~~ a substrate;

a metamorphic buffer layer disposed between the photoconversion structure and the substrate;

a p-type anode layer;

a n-type cathode layer, wherein the InGaAs absorption layer is disposed between the p-type anode layer and the n-type cathode layer; and

an etch stop layer, the etch stop layer being disposed between the n-type cathode layer and the metamorphic buffer layer.

2. (Currently Amended) The photodetector of claim 1, ~~further comprising a metamorphic buffer layer disposed between the photoconversion structure and the substrate,~~ wherein the metamorphic buffer layer ~~having~~ has a varying composition such that the metamorphic buffer layer is lattice matched to the photoconversion structure and the substrate.

3. (Currently Amended) The photodetector of claim 1, wherein the photoconversion structure has a first lattice constant, and the substrate has a second lattice constant, ~~the photodetector further comprising a metamorphic buffer layer disposed between the photoconversion structure and the substrate,~~ wherein the metamorphic buffer

layer ~~having~~ has a varying composition such that a lattice constant of the metamorphic buffer layer grades from approximately the first lattice constant to approximately the second lattice constant.

4. (Original) The photodetector of claim 3, wherein the photoconversion structure comprises one of a PIN diode, a waveguide PIN diode, a resonant cavity enhanced diode, an avalanche diode, and a metal-semiconductor-metal photodiode.

5. (Original) The photodetector of claim 3, wherein the Group III sublattice indium concentration is between 54% and 64%, inclusive.

6. (Original) The photodetector of claim 3, wherein the Group III sublattice indium concentration is between 61% and 64%, inclusive.

7. (Original) The photodetector of claim 3, wherein the Group III sublattice indium concentration is between 57% and 59%, inclusive.

8. (Canceled)

9. (Previously Presented) The photodetector of claim 1, further comprising a reflective layer, wherein the substrate is disposed between the reflective layer and the photoconversion structure, the reflective layer being adapted to reflect light transmitted by the InGaAs absorption layer back into the InGaAs absorption layer.

10. (Currently Amended) The photodetector of claim 3, wherein the ~~undoped~~ substrate comprises gallium arsenide, and

wherein the metamorphic buffer layer comprises indium aluminum arsenide having a Group III sublattice concentration of indium that varies according to position relative to the substrate and the photoconversion structure.

11. (Currently Amended) A method for creating a photodetector, the method comprising:

forming an indium gallium arsenide (InGaAs) absorption layer for a photoconversion structure such that the InGaAs absorption layer has a Group III sublattice indium concentration greater than 53%;

providing a ~~an undoped~~ substrate, wherein the substrate comprises a first surface and a second surface;

forming a metamorphic buffer layer on the substrate, comprising:

maintaining the substrate at a temperature between 380° C and about 420° C;

supplying a flux of aluminum, a flux of arsenic, and a flux of indium to the substrate; and

varying a ratio of the flux of arsenic and the flux of indium; and

forming a reflective layer on the first surface, the reflective layer being adapted to reflect light transmitted by the InGaAs absorption layer back into the InGaAs absorption layer.

12. (Original) The method of claim 11, wherein forming the InGaAs absorption layer comprises controlling production parameters such that the Group III sublattice indium concentration of the InGaAs absorption layer is between 54% and 64%, inclusive.

13. (Original) The method of claim 11, wherein forming the InGaAs absorption layer comprises controlling production parameters such that the Group III sublattice indium concentration of the InGaAs absorption layer is between 61% and 64%, inclusive.

14. (Original) The method of claim 11, wherein forming the InGaAs absorption layer comprises controlling production parameters such that the Group III sublattice indium concentration of the InGaAs absorption layer is between 57% and 59%, inclusive.

15. (Previously Presented) The method of claim 11, further comprising:

forming a metamorphic buffer layer on the substrate; and

forming the photoconversion structure on the metamorphic buffer layer, and wherein the metamorphic buffer layer has a varying composition such that a lattice constant of the metamorphic buffer layer is lattice matched to the substrate and the photoconversion structure.

16. (Currently Amended) The method of claim 11, wherein the substrate has a first lattice constant, further comprising:

~~forming a metamorphic buffer layer on the substrate; and~~

forming the photoconversion structure on the metamorphic buffer layer, wherein the photoconversion structure has a second lattice constant, and wherein the metamorphic buffer layer has a varying composition such that a lattice constant of the metamorphic buffer layer grades from the first lattice constant to the second lattice constant.

17. (Currently Amended) The method of claim 16, wherein the substrate comprises gallium arsenide~~, and wherein forming the metamorphic buffer layer comprises:~~

~~maintaining the substrate at a temperature between 380° C and about 420° C;~~

~~supplying a flux of aluminum, a flux of arsenic, and a flux of indium to the substrate; and~~

~~varying a ratio of the flux of arsenic and the flux of indium~~.

18. (Previously Presented) The method of claim 16, wherein the metamorphic buffer layer is formed in the second surface.

19. (Original) The method of claim 18, further comprising thinning the substrate before forming the reflective layer.

20. (Currently Amended) A photodetector for converting an optical signal into an electrical signal, the photodetector comprising:

~~an undoped~~ a substrate structure, wherein the substrate structure comprises:

a substrate layer; and

a metamorphic buffer layer formed on the substrate layer; and

a photoconversion structure formed on the substrate structure, the photoconversion structure comprising:

an indium gallium arsenide (InGaAs) absorption layer having a Group III sublattice indium concentration greater than 53%;

a p-type anode layer;

a n-type cathode layer, wherein the InGaAs absorption layer is disposed between the p-type anode layer and the n-type cathode layer; and

an etch stop layer, the etch stop layer being disposed between the n-type cathode layer and the metamorphic buffer layer.

21. (Original) The photodetector of claim 20, wherein the Group III sublattice indium concentration is less or equal to 64%.

22. (Previously Presented) The photodetector of claim 20, wherein the optical signal comprises light at a wavelength of 1.55 μm, and wherein the Group III sublattice indium concentration is between 61% and 64%, inclusive.

23. (Original) The photodetector of claim 22, wherein the optical signal further comprises light at a wavelength of 1.3 μm.

24. (Original) The photodetector of claim 20, wherein the optical signal comprises light at a wavelength of 1.3 μm, and wherein the Group III sublattice indium concentration is between 57% and 59%, inclusive.

25. (Currently Amended) The photodetector of claim 20, wherein the substrate structure comprises:

a substrate layer~~; and~~

~~a metamorphic buffer layer formed on the substrate layer~~, wherein the metamorphic buffer layer ~~having~~ has a first surface and a second surface,

wherein the first surface is in contact with the photoconversion structure and the second surface is in contact with the substrate layer, and

wherein the metamorphic buffer layer has a varying composition such that the first surface is lattice matched with the photoconversion structure and the second surface is lattice matched with the substrate layer.

26. (Currently Amended) The photodetector of claim 20, wherein the photoconversion structure has a first lattice constant equal to a lattice constant of the InGaAs absorption layer, and wherein ~~the substrate structure comprises:~~

~~a~~ the substrate layer ~~having~~ has a second lattice constant~~; and~~

~~a metamorphic buffer layer formed on the substrate layer~~, and wherein the metamorphic buffer layer ~~having~~ has a first surface and a second surface, wherein the first surface is in contact with the photoconversion structure and the second surface is in contact with the substrate layer, and wherein the metamorphic buffer layer has a varying composition such that a lattice constant of the metamorphic buffer layer grades from the first lattice constant at the first surface to the second lattice constant at the second surface.

27. (Canceled)

28. (Canceled)

29. (Currently Amended) The photodetector of claim 27, wherein the ~~undoped~~ substrate comprises gallium arsenide,

wherein the metamorphic buffer layer comprises indium aluminum arsenide (InAlAs),

wherein the n-type cathode layer comprises InAlAs, and

wherein the p-type anode layer comprises InGaAs.

30. (Original) The photodetector of claim 29, wherein a thickness of the metamorphic buffer layer is between 1500Å to 2 μm, and wherein a thickness of the InGaAs absorption layer is substantially equal to 7000Å.

31. (Original) The photodetector of claim 30, wherein the substrate structure further comprises a reflective layer, the reflective layer being reflective to the optical signal, and wherein the substrate layer is disposed between the reflective layer and the metamorphic buffer layer.

32. (Original) The photodetector of claim 31, wherein the substrate layer is 100 μm thick or less.

33. (Original) The photodetector of claim 31, wherein the substrate layer is 50 μm thick or less.